



ELECTRONIC TUBE REFERENCE

150B2

Voltage Regulator electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

VOLTAGEREGULATOR

Precision 150 V cold-cathode gas regulator operating around 5-15 mA, with published long-term and temperature-stability characteristics for instrumentation.

GENERAL CHARACTERISTICS

BASE DESIGNATION	MINIATURE 7P	BASE PINS	7
NOMINAL HEATER	– / –	PARALLEL HEATER	– / –
HEATING	Indirect; cold cathode	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Voltage Regulator	
REGULATOR VOLTAGE	150 V
MINIMUM REGULATOR CURRENT	5 mA
MAXIMUM REGULATOR CURRENT	15 mA
STARTING VOLTAGE	180 V
MAINTAINING VOLTAGE	150 V
DYNAMIC IMPEDANCE	250 Ω
<i>Gas-discharge device.</i>	

150B2 — Voltage Stabiliser Tube

A cold-cathode, gas-filled voltage stabiliser and reference level tube designed to establish and maintain a stable 150 V DC output across a wide range of operating conditions.

Overview

The **150B2** (also designated as **150 B 2**) is a miniature, gas-filled stabilising tube designed for voltage regulation and reference applications. It provides a nominal maintaining voltage of **150 V** over a recommended cathode current range of **5.0 to 15 mA**. Manufactured by companies such as Mullard and Philips, the tube is engineered to deliver high stability, low temperature drift, and reliable ignition characteristics throughout its operating life.

Construction, Base, and Pinout

The 150B2 is constructed in a compact glass envelope utilizing a standard **Miniature 7-pin (B7G)** base. Its physical dimensions are highly standardized, though minor variations exist across manufacturing specifications:

- **Maximum Bulb Diameter:** 19 mm
- **Maximum Seated Height:** 47.5 mm to 48 mm
- **Maximum Overall Height:** 54 mm to 54.5 mm

Pin Connections

When viewed from the underside of the base, the electrical connections are assigned as follows:

Pin	Connection
1	Anode (a)
2	Cathode (k)
3	Internal Connection (IC)
4	Internal Connection (IC)
5	Internal Connection (IC)
6	Internal Connection (IC)
7	Internal Connection (IC)

Note: Pins designated as Internal Connection (IC) must not be used for external circuit junctions or tie points. The tube must be operated strictly with the cathode negative and the anode positive.

To ensure mechanical reliability and prevent premature failure, the tube must not be subjected to severe shock or continuous vibration.

Electrical Characteristics and Ignition

Measured at an ambient temperature of between 20°C and 30°C, the initial electrical characteristics of the 150B2 are highly controlled:

- **Maintaining Voltage (V_a):** Nominally 150 V. At a continuous cathode current of 10 mA, the initial maintaining voltage is guaranteed to remain between a minimum of **146 V** and a maximum of **151 V** (with some specifications allowing up to **154 V**).
- **Ignition Voltage (V_{ign}):** Under normal ambient illumination of 50 to 500 lux, the maximum voltage required to initiate discharge is **180 V**. In complete darkness, the maximum required ignition voltage increases to **225 V**.
- **Supply Voltage (V_b):** A minimum supply voltage of **180 V** is required to guarantee reliable ignition throughout the entire operating life of the tube.
- **Regulation Voltage:** When the cathode current is varied from 5.0 to 15 mA, the increase in maintaining voltage is limited to a maximum of **5.0 V**, with an average variation of **3.0 V**.
- **Temperature Coefficient:** The temperature coefficient of the maintaining voltage at 10 mA is approximately **0.007% per °C** (or **10 mV/°C**).
- **Incremental Resistance:** At a cathode current of 10 mA, the incremental resistance is approximately **250 Ω**. The incremental resistance becomes positive at cathode currents exceeding 5.0 mA.
- **Voltage Jumps:** Within the cathode current range of 10 to 15 mA, typical maximum voltage jumps are restricted to **75 mV**.

Absolute Maximum Ratings

To prevent damage and ensure the rated operating life, the 150B2 must be operated within the following absolute maximum limits:

Parameter	Rating
Maximum continuous cathode current	15 mA
Minimum continuous cathode current	5.0 mA
Maximum surge/starting current	40 mA
Maximum negative anode voltage	130 V
Minimum bulb temperature ($I_k = 0$ mA)	-55 °C
Maximum ambient temperature (operating/storage)	+70 °C to +90 °C

Operating Notes

1. **Thermal Equilibrium:** The tube reaches full thermal equilibrium within **3 minutes** of ignition.
2. **Surge Current Restriction:** Operation at the maximum surge current of 40 mA must be restricted to a maximum duration of **30 seconds** (or up to **40 seconds** depending on the specification) in any 8-hour period of use to preserve tube life.

Long-Term Stability and Life Performance

When operated continuously at the specified currents, the 150B2 exhibits highly stable long-term performance at room temperature:

- **Maintaining Voltage Variation:**
 - **In 1,000 hours** at 10 mA: Maximum variation of **+1% to -0.5%** (or a maximum overall variation of **1%**).
 - **In 10,000 hours** at 5 and 10 mA: Typical maximum variation of **+2% to -1%**.
 - **In 30,000 hours** at 5 and 10 mA: Typical maximum variation of **+2% to -1%**.
- **Regulation Degradation:** The typical maximum increase in maintaining voltage when the cathode current is swept from 5.0 to 15 mA degrades slightly over time:
 - **In 1,000 hours:** Maximum regulation voltage increase of **4.0 V**.
 - **In 10,000 hours:** Maximum regulation voltage increase of **6.0 V**.

Operating Curves and Ignition Dynamics

The ignition delay of the 150B2 in dark environments is characterized by a cumulative probability distribution. The time required for the tube to ignite is statistically dependent on the applied supply voltage; generally, an increase in the supply voltage significantly reduces the dark ignition delay time.

The relationship between the operating anode voltage (V_a) and the anode current (I_a) is bounded by defined upper and lower voltage limits. These limits outline the acceptable envelope of operation from 2 mA up to 14 mA, ensuring that the maintaining voltage remains stable and predictable within the specified current boundaries.

SOURCE OPERATING CONDITIONS

1953 RFT Rundfunk Technik

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1953 RFT RUNDFUNK TECHNIK

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Nominal maintaining voltage	150 V	—
Voltage variation over current range	4.5 V	—
Warm-up / stabilization time	10 min	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Current range	5 to 15 mA	—
Nominal current	10 mA	—

SOURCE OPERATING CONDITIONS

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1957 Philips Receiving and Amplifying Tubes

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1957 PHILIPS RECEIVING AND AMPLIFYING TUBES

Section 1 · Voltage Regulator

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Operating Voltage	150 V	—
Regulation	5 V	Published current range

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition Voltage Maximum	225 V	—
Minimum Operating Current	5 mA	—
Maximum Operating Current	15 mA	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1963 Philips Electron Tubes Handbook V2

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1963 PHILIPS ELECTRON TUBES HANDBOOK V2

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maintaining voltage at 10 mA	146–154 V	—
Voltage regulation	—5 V	Ia=5-15mA
Voltage variation during 1000 hours	—1 %	Ia=10mA
Temperature coefficient	10 mV/degC	—



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1971 Mullard Gas Filled Tubes

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1971 MULLARD GAS FILLED TUBES

Section 1 · Voltage Regulator

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maintaining voltage	150 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Incremental resistance	250 ohm	—
Regulation voltage	4 V	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Ignition/striking voltage	180 V	—
Minimum cathode current	5 mA	—
Maximum cathode current	15 mA	—


SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1999 Philips 0-D

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1999 PHILIPS 0-D

Section 1 · Voltage Regulator

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Average operating voltage	150 V	—
Maximum regulation variation	5 V	—
Operating voltage minimum	146 V	Current=10mA
Operating voltage maximum	154 V	Current=10mA
Temperature coefficient	10 mV/degC	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum starting voltage	180 V	—
Minimum operating current	5 mA	—
Maximum operating current	15 mA	—
Dark starting voltage maximum	225 V	CompleteDarkness
Starting current maximum	40 mA	Duration<=40s